

## Role of the Bering Strait on the hysteresis of the ocean conveyor belt circulation and glacial climate stability

Aixue Hu<sup>a</sup>, Gerald A. Meehl<sup>a</sup>, Weiqing Han<sup>b</sup>, Axel Timmermann<sup>c</sup>, Bette Otto-Bliesner<sup>a</sup>, Zhengyu Liu<sup>d</sup>, Warren M. Washington<sup>a</sup>, William Large<sup>a</sup>, Ayako Abe-Ouchi<sup>e</sup>, Masahide Kimoto<sup>e</sup>, Kurt Lambeck<sup>f</sup>, and Bingyi Wu<sup>g</sup>

<sup>a</sup>Climate and Global Dynamics Division, National Center for Atmospheric Research, Boulder, CO 80305;

<sup>b</sup>Department of Atmospheric and Oceanic Sciences, University of Colorado, Boulder, CO 80301;

<sup>c</sup>Department of Oceanography, University of Hawaii, HI 96822;

<sup>d</sup>Center for Climate Research, Nelson Institute for Environmental Studies, University of Wisconsin, Madison, Wisconsin 53706;

<sup>e</sup>Atmosphere and Ocean Research Institute, University of Tokyo, Chiba 277-8568, Japan;

<sup>f</sup>Research School of Earth Sciences, The Australian National University, Canberra, ACT 0200, Australia;

<sup>g</sup>Chinese Academy of Meteorological Sciences, Beijing, China 100081

Abrupt climate transitions, known as Dansgaard-Oeschger and Heinrich events, occurred frequently during the last glacial period, specifically from 80–11 thousand years before present, but were nearly absent during interglacial periods and the early stages of glacial periods, when major ice-sheets were still forming. Here we show, with a fully coupled state-of-the-art climate model, that closing the Bering Strait and preventing its throughflow between the Pacific and Arctic Oceans during the glacial period can lead to the emergence of stronger hysteresis behavior of the ocean conveyor belt circulation to create conditions that are conducive to triggering abrupt climate transitions. Hence, it is argued that even for greenhouse warming, abrupt climate transitions similar to those in the last glacial time are unlikely to occur as the Bering Strait remains open.